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foundation is an evolutionary process. Man has never yet interfered very successfully with the great scheme of organic evolution, and there is no reason to suppose that he can propose a superior substitute for the evolutionary process in the development of science. Selectionists have practically abandoned the belief that they can create new things at will, and are content now to discover, preserve, and combine what already exists or what may come into existence without their aid. Practical scientists may well take their cue from the selectionists, permit investigation to take its own course, and choose from among its products such as seem capable of application.

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### WHAT BECOMES OF THE FUR SEALS

THE census of Alaska fur seals in 1921 as computed by Mr. Edward C. Johnston, of the U. S. Bureau of Fisheries, amounted to a total of 581,457 animals, exclusive of 22,546 surplus males which were killed for commercial purposes. This is a low but substantial increase of 5.2 per cent. over the figures for 1920. The annual percentages of increase of the class of breeding cows since 1912 have been as follows:

1913.....	12.54
1914.....	1.06
1915.....	11.02
1916.....	12.99
1917.....	9.44
1918.....	11.63
1919.....	9.97
1920.....	6.59
1921.....	5.22

Since it is this class which is the controlling element of the herd it will be instructive to examine these figures with considerable care. In the first place, the great variation from year to year in the rate of increase is most noticeable; but it is no greater than that which is found to exist on the several rookeries, as an examination of the complete reports published by the Bureau of Fisheries will show.

To some persons the above figures may appear satisfactory. Every year since the cessation of pelagic sealing in 1911 a gain has been

shown, whereas a loss was sustained from 1886 to that date. It was during this last period that uncontrolled slaughter of the females developed and threatened the very existence of the species before it could be checked through diplomatic channels.

Others will doubtless ask, "Why have the increases been so low?" A species of animal the female of which brings forth one young each year and approximately ten in a lifetime should increase annually more than 8.98 per cent. on the average. But that is all that an average of the above percentages will show.

Several facts have been learned the past few years which throw some light on this important subject. For instance, it has been found in several successive years that only one half of the females which are born live to be three years old. The loss of the class on the islands before the pups learn to swim is about one per cent. It varies from three fourths of one per cent. to one and one half, depending entirely upon how many bulls more than necessary are present on the rookeries. The annual loss of females through actual killing on the islands does not exceed 75, or less than five hundredths of one per cent.; all such deaths are purely accidental and largely unavoidable in the conduct of commercial work.

Therefore, the loss can take place in but one other place and that is in the sea. The figure of 50 per cent. loss the first three years was obtained in the following manner: The loss of breeding females, due to old age, is about 10 per cent. each year because the average breeding age is about 10 years. If this 10 per cent. be deducted from the number of breeding females in any year, say 1915, the remainder will represent the breeders of that year which remained alive in 1916. If this be taken from the total number of breeders in 1916, the last remainder will represent the increment of new three-year-old cows that year because the first young are born the third year. In several seasons this increment has been only about 50 per cent. of the number of female pups born three years previously. In other words, the loss amounts to one fourth the total number of births in any one year. Out of the females born during the last nine years, therefore, the following losses have been suffered:

1912.....	20,246
1913.....	23,067
1914.....	23,312
1915.....	25,881
1916.....	29,249
1917.....	32,006
1918.....	35,728
1919.....	39,293
1920.....	41,881
1921.....	44,163

Total .....314,831<sup>1</sup>

The great question is, "What has become of this enormous total of 300,000 female seals?"

Some are killed by unlawful pelagic sealing. A few bullets and buckshot are found in the carcasses of males almost every year on the killing fields, although no seal can be shot legally. The number so killed, however, must be insignificant and the work sporadic in character up to 1921. While it should not be ignored by any means, it is not sufficiently great to concern us in such a broad analysis of the subject as we are here making.

Some other females are lawfully killed at sea by Indians under the provisions of the treaty of December 15, 1911. The number so taken in any one year is not excessive, a few hundred at most, yet it is sufficiently great that it should be stopped. The object of the treaty mentioned was to abolish pelagic sealing so as to protect the female seals. Therefore, permitting the work at all defeats the main purpose of the agreement and the objectionable clause should certainly be amended at the first opportunity. The Indians were given the privilege because they had hunted seals at sea from prehistoric times. There are many ways in which the natives can be recompensed without permitting them to destroy the important element of any species of wild life.

There is no evidence of any loss of seals at sea due to disease or starvation. The animals are always fat and healthy when they leave their island home and also when they return.

<sup>1</sup> It should be explained that in fur seal census computations, while the figures appear exactly as though a precise enumeration had been made, only round numbers are intended to be implied. The possible error in the above computations would be approximately plus or minus five per cent.

Exceptions to this rule are so rare that they may be entirely ignored.

There is only one other known method by means of which the herd suffers a loss in the sea. This is the result of the depredations of killer whales. Each spring and fall these "wolves of the sea" come about the Pribilof Islands in schools and have been seen to devour seals in large numbers. I once saw a school capture three seal pups in less than five minutes. In their eagerness to capture their prey they sometimes "run aground" and of course then die. The stomachs of two which thus came ashore were once examined by Captain Bryant and in them he found 18 and 24 seals, respectively, \$2,000 meals each of them.

That the destruction of seal life about the islands by the killers is very great is incontrovertible. Whether it continues as both animals migrate southward is unknown. We know with a fair degree of accuracy the direction and distance traveled by the seals but the habits of the animals during the long period of their lives when they are in the water are practically unknown.

There may be other pelagic enemies besides the killers, but it is doubtful; if so, they are entirely unknown.

Of course, the males suffer as great a loss as the females and there is some evidence which indicates that it is even greater. As a class the former do not swim so far to the southward, and it is possible that the killers normally remain in the colder waters. At any rate, we know that 300,000 of them have been lost during the past nine years. If they had been taken commercially and their skins sold for revenue they would have brought the enormous total of \$15,000,000, upon the assumption of a value of \$50 per skin. But during much of this period they brought \$100 each or more.

Such financial loss to the government can not be passed unheeded. That sum would have paid for all of the scientific investigations, good and bad, which have ever been made of the fur seal. Each year the actual loss amounts to more than \$1,000,000.

It has been urged that a small part of this be used for the study of this new "fur seal question." Seldom does a scientific investigation

have such a chance to show immediate financial results as this. If the activity of the enemy could be reduced one per cent. it would increase revenue over \$10,000 per year.

It is therefore suggested that the activities of the killer whale be thoroughly investigated in its relation to the fur-seal herd. To do so, will require the services of a well-equipped vessel. It should be provided with a whale gun and a man to shoot it, because some of the animals would have to be killed.

The stomachs of the killers taken should of course be examined. It may be asked why the preliminary work can not be done by the shore whaling stations, but it so happens that almost every cetacean known is commercially valuable except the killer. From the diminutive porpoise to the huge sulphurbottom all are taken but the orca, and it is left entirely alone. Therefore, the fur-seal question can not be studied on shore, where whales are utilized commercially without special arrangements being made for the capture of the killers.

If the killer be found the great destroyer of fur seals which is suspected, then methods for its destruction should be devised. In lieu of submarines, it might be made the object of target practice of navy gunners. Or a bounty might be offered, so as to make them commercially profitable for whalers to handle. Or what is probably best of all such suggestions, fully equip whaling vessels to scour the seas, just as sheep men of the west keep coyote hunters constantly on duty.

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## SCIENTIFIC EVENTS

### LOSS FROM ANIMAL DISEASES

THE Advisory Committee, appointed by the British Development Commission in 1920, has issued its report on the facilities now available for the scientific study of the diseases of animals, and improvements recommended. Sir David Prain was chairman of the committee.

According to an abstract in the *London Times*, the present value of cattle, sheep, and pigs in the United Kingdom is estimated, the report states, at between four and five million pounds. The Scottish Animal Diseases Re-

search Association estimates the annual loss from disease in Scotland at close on £1,000,000, and the committee thinks that the loss in England and Wales must be four times the loss in Scotland. The facilities for research at the five veterinary colleges in the United Kingdom and Ireland "constitute a national disgrace." The sum allocated to veterinary research is "trifling in comparison with the sums set aside for medical, agricultural, and fishery research." There are certain existing facilities at universities, medical schools, the Brown Institution, and attached to the English and Irish Departments of Agriculture and to the Royal Army Veterinary Corps. In South Africa there is a model organization for the study of animal diseases, £123,447 having been spent during the year 1920-21 on veterinary education and research. In India immense opportunities are almost wholly neglected. Leaving out of account the work in South Africa, the state of research into animal diseases within the empire is at present lamentable.

The committee advocates (with reservations by Sir Walter Fletcher) increased salaries to workers of proved capacity at Camden Town, and a capital grant for new laboratories there. It suggests that facilities for research should be placed at the disposal of the Royal Army Veterinary Corps, and that a sum should be set aside annually by the commissioners for special researches into animal diseases.

With regard to the training of investigators, it anticipates that a large proportion will come from the veterinary profession. It is against the increase in the number of universities with veterinary faculties, but wishes more money to be given to the existing veterinary colleges. It proposes that the Development Commission should appoint a diseases of animals research committee, the majority of whom should be men of science. To this new body all applications for grants from the development fund for research into the diseases of animals should be referred.

### THE CALIFORNIA STATE FISHERIES LABORATORY

THE State of California, through its Fish and Game Commission, has constructed a laboratory in East San Pedro, at Los Angeles